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A COMPARISON OF RIDING QUALITY OF REFRIGERATOR CARS LOADED WITH BANANAS SHIPPED FROM NEW ORLEANS, LOUISIANA, TO CHICAGO, ILLINOIS, JULY 27-30, 1948

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Introduction

The purpose of the test was to compare the riding quality of refrigerator cars differing only in type of draft gears or undersill used in their construction. Two types of draft gears were tested. One was the conventional type (Miner) made with steel wedges and springs, the other was the Waughmat draft gear in which rubber discs and steel plates are used to take up shocks. A third set of cars were equipped with Duryea sliding center-sills that move against compression springs when longitudinal impacts are received. Details of the contruction of the draft gears and underframe are not included in the report. They can be supplied by the manufacturer.

Bananas are particularly suited for testing the riding quality of refrigerator cars since they are shipped without covering or container and when bruised a discolored area develops that is easily detected.

Plan of Test

Cars:

Through the cooperation of the Fruit Dispatch Company, the Merchants Despatch Transportation Corporation and the Illinois Central Railroad, 17 cars of bananas were loaded with bunches of fruit as nearly alike as possible. The test cars in train order from the caboose are listed below:

Car Number & Train Order	Tare Wt. lbs.	Draft Gear 1/	Floor Rack
Business Car			
Messenger Caboose			
Caboose			
MDT 9501	58,380	Miner	Conventional smooth wood slats.
IC 51,000	51,000	Duryea	Specially designed, grooved and perforated aluminum slats and stringers.
MDT 9485	59,100	Miner	Grooved and perforated wood slats to simulate aluminum slats.
MDT 9471	59,500	Waughmat	" " "
MDT 9496	59,620	Miner	" " "
MDT 9475	61,000	Duryea	" " "
MDT 9497	58,720	Miner	" "

MDT 9517	58,820	Miner	Conventional
MDT 9473	59,480	Waughmat	"
MDT 9470	59,840	Waughmat	"
MDT 9474	59,320	Waughmat	Grooved and perforated.
MDT 9472	59,340	Waughmat	" " "
MDT 9476	60,540	Duryea	" " "
MDT 9478	60,560	Duryea	Conventional
MDT 9477	60,720	Duryea	Grooved and perforated.
MDT 9479	50,580	Duryea	Conventional
MDT 9579	58,520	Miner	"
Balance of train.			
Engine			

1/ The Miner draft gear was model A-22XB and the Waughmat draft gear model WM-4-6 Twin Cushion.

All cars were equipped with A-3 Ride Control trucks with longer spring travel (3-3/4 inches approximately) than older trucks. The cars had Preco fans, side wall air ducts, ice grates adjustable for stage icing and all except the aluminum I.C. car were steel sheathed. It will be noted from the above list that two types of floor racks were compared, one of which was grooved to hold the banana stalks from slipping. The train order of test cars placed a Duryea undersill car between two cars with the conventional Miner gears; next was a car with Waughmat draft gears similarly placed between two cars with Miner gears. This arrangement was repeated with another Duryea car, between buffer cars with Miner gears followed by four cars with Waughmat and four with Duryea undersill. This gave an opportunity to determine the effects of cars of the same type on each other, and also the effect of a car of one type on a car of a different type placed next to it in the train.

Impact Registers:

In each test car an impact register was mounted on a heavy shelf bolted to the car wall at the door post and the first intermediate post (Fig. 1) 2/. The registers were 62 inches above the floor-racks with clock mechanism to the rear of the car. They were secured tightly to the shelf with an iron strip and bolts. These precautions were taken to avoid any vertical or longitudinal movement of the instrument. Duplicate one-way impact registers were installed in six cars. They were nailed to the wall opposite the shelf-mounted instruments, were at the same level and also had the clock mechanism to the rear of the car. All registers but one had been calibrated for the test by the Impact Register Company. This instrument, 3209, was a new one recently received from the factory. These recorders mark longitudinal impacts on a tape divided into five zones. Zone 1 and the first half of zone 2 are considered "normal handling"; the second half of zone 2 as "borderline", zone 3 "rough handling" with impacts of 6 to 7 m.p.h., zone 4 impacts of 8 to 9 m.p.h. and zone 5, 10 to 11 m.p.h. The vertical impact mechanism was set to record nothing in the

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2/ Photographs for Figs. 1 to 3 were taken by George Dexter, Fruit Dispatch Co., New Orleans, La.

first zone until 0.3G was reached, then each zone represents 0.3G (G equals the pull of gravity).

Loading:

The cars were loaded between 2:30 and 4:40 PM, July 27, with bananas that were practically free from scarring. The size of the stems was referred to as "nines", that is consisting of nine or more hands. The bottom layer of stems was placed upright on the stalks in alternate rows. Two "pillow" bunches were placed crosswise at the bulkhead on the top of the vertical stems, and the top layer was placed against these bunches at an angle three-fourths of vertical. This load is referred to as 1-3/4 and the number of rows in the top layer in each end is indicated by the notation 4/5 or 5/5, etc., that is, 4 rows in one end, 5 in the other, or 5 in each end. Loading data and inspection of loads in transit are given in Table 1. Figure 2 shows the load at the doorway at completion of loading. Note the two "key" bunches placed across the load at the doorway to hold vertical bunches in place. These work their way down to the floor-racks as slack develops in the load (Figure 3). A chalk line was drawn on the side walls at the top of the load in each end of the car to give a measure of settling of the load in transit. The fruit was all of the Fortuna variety from Honduras and was of a desirable green color and maturity. Temperatures at completion of loading were mostly 60° to 62° F.

Handling of Cars in Transit:

The plan was to give the train normal handling in transit except for quick stops to be made at Memphis, Tenn., Fulton, Ky., and Bluford, Ill. At Memphis the 17 test cars with 2 buffer cars were brought to a full stop from a speed of 12-14 m.p.h. by automatic air brake application on all cars. The stop required 75 feet and gave only a minor impact in Zone 1.2. At Fulton, Ky., a stop was made from a speed of 8 m.p.h. using automatic air brakes, and sand on the track and throttle off on the engine. It gave an impact of 1.2 and a similar shock when engine brakes only were used. The distances required to bring the train to a stop were 75 and 60 feet, respectively.

At a slower train speed of 6 m.p.h. a complete stop was made in 45 feet which gave shocks that registered 2.0 and 1.5 and 1.4 zones. These were not considered to be worth repeating and no quick stops were made at Bluford, Ill., as had been planned. The cars were given the usual handling in Markham Yards (Chicago) and were run over the hump track. The first 11 of the test cars, starting at the head end with MDT 9579 (table 1) came over singly as was intended, and had impact speeds of 5 to 8 m.p.h. MDT 9474 was not in the train, having left it at Fulton, Ky., where it was bad-ordered. The next two cars, MDT 9503 and 9475, stuck in the retarder. They were freed by 9596 which in turn was not released and held back 94[illegible], 9485, 51,000 and 9501. These five cars came free and hit the train together. All seven cars were then pulled back and were humped singly. They had impact speeds of 5 to 8 m.p.h. Thus all seven cars at the rear of the train had two impacts as compared with only one for the first 11 cars.

Inspection Methods:

The loads were examined by doorway inspection at Jackson, Miss., Memphis, Tenn., Fulton, Ky., Bluford, Ill., and Markham Yards, Ill. Any shifting of the load or disarrangement was noted (table 1). When the cars were unloaded in Chicago, each bunch of bananas was examined by experienced scar counters and the fruit classified according to degree of scarring, i.e., heavy, medium, slight, and no scarring. Records on the load were segregated into those for bottom hands only, for stems in the top layer and for those in the bottom layer next to bulkhead and sidewalls. In the final tabulation scarring was indexed by multiplying the percentage figures by factors of 1.0, 0.5, and 0.25 and 0 for heavy, medium, slight and no scarring respectively.

Results:

The schedule of the test train is shown in table 2. It was considered an average trip with respect to time and speed enroute which averaged 25.5 m.p.h while running.

The longitudinal impacts which were transmitted to the recorders are tabulated in table 3. The best showing in respect to number of impacts was made by the following cars: MDT 9476, 9478, 9479, 9477, and IC 51,000. They all had Duryea undersills. The instruments showing the greatest number of impacts were in MDT 9517 and 9497, both equipped with Miner draft gears. The following list shows the total number of impacts over 2.0 zone segregated by type of draft gear or undersill.

Car MDT	Miner Gears Impacts	Car MDT	Waughmat Impacts	Car MDT	Duryea Impacts
9501	12	9471	4	9475	3
9485	4	9473	7	9476	1
9496	13	9470	4	9478	1
9497	27	9472	6	9477	1
9517	35			9479	1
9579	20			I.C. 51,000	2

The cars that were put over the hump twice showed 2 impacts (time interval 9-12 M 7/30); the first 4 Duryea cars were the only ones to show one impact, while in the Markham Yards. The type of draft gears on adjacent cars appeared to have an influence on the impacts recorded. When cars with Miner draft gears were together they had more impacts than when coupled to cars with either Waughmat gears or Duryea undersills. The Duryea cars that were coupled together (9476, 9478, 9477 and 9479) had fewer impacts registered than the single Duryea (9475). The car with a Miner draft gear coupled between a Waughmat and a Duryea (9485) made the best showing of all Miner draft gear cars. The duplicate impact registers gave very similar records for the most part.

The magnitude of the impacts received by the cars is also of interest in comparing their riding quality. Some Duryea cars showed longitudinal impacts greater than Zone 3.0 and the maximum was 3.4. The cars equipped with Miner gears had a maximum impact of 3.8 and the Waughmat cars showed several impacts in Zone 4 with a maximum of 4.8. These records indicate that all three types of cars fell short of handling large longitudinal impacts and the inspection of the loads in respect to shifting bears out this conclusion.

The vertical impact records are given in table 4. Some cars had many vertical impacts and others were practically free from them. The tabulation shows the Waughmat to have the best record.

Miner Gears		Waughmat		Duryea	
MDT	Impacts	MDT	Impacts	MDT	Impacts
9501	159[1]	9471	4	9475	12
9485	52[1]	9473	2	9476	223
9497	108	9474	3	9477	25

Scarring of Fruit:

The percentage of stalks showing scarring in each car is shown in table 5. These are weighted percentages as described under methods of inspection and they are for the three parts of the load as indicated. The cars with the least and greatest amount of scarring of both loads are listed below.

Cars with Least Bottom Hand Damage

MDT	Type Gear	Floorrack	Pct. Damaged	Longitudinal Impacts
9478	Duryea	Smooth	5.1	1
9477	Duryea	Grooved	5.8	1
9479	Duryea	Smooth	6.7	1
9473	Waughmat	Smooth	7.5	7

Cars with Greatest Bottom Hand Damage

MDT	Type Gear	Floorrack	Pct. Damaged	Longitudinal Impacts
9501	Miner	Smooth	17.6	12
9579	Miner	Smooth	16.3	20
I.C.51,000	Duryea	Grooved	13.7	2
9471	Waughmat	Grooved	13.5	4

Three of the best cars in respect to bottom hand damage had Duryea undersills and showed the lowest number of longitudinal impacts. However, the story is not told entirely by the number of impacts for I.C. 51,000 had only 2, but these were great enough to move the load away from the bulkhead about two feet. The four Duryeas at the head end of the test cars made the best showing in respect to longitudinal impacts and freedom from scarring of bottom hands. Damage to the bottom hands was considered most important since it is often severe because of the weight of the load. Scarring of top bunches was also least in the four Duryea cars grouped together and in a single Waughmat car (9471). Stalks next to the side walls and bulkheads showed least damage in 9478, I.C. 51,000, 9477, and 9479, all equipped with Duryea underframes.

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[1] Meter did not meet calibration standard of Impact Register Co., but was satisfactory by other calibration.

There was no apparent correlation between settling or shifting of the load in transit and the type of underframe. All cars but the following three showed shifting after the impacts received in the hump yards at Markham: MDT 9497 and 9579 (Miner) and 9470 (Waughmat).

There were no consistent differences in scarring that could be attributed to special grooved floor racks designed to prevent shifting of stalks.

Acknowledgements

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The helpful cooperation of the following is gratefully acknowledged: The Fruit Dispatch Company, for furnishing the fruit for the test and handling all arrangements for loading and unloading; the Illinois Central Railroad over whose lines the test moved for furnishing transportation and accommodations for the test party; the Merchants Despatch Transportation Corporation for the test cars used and for office facilities in Chicago; and to the Fruit Dispatch Company, the Illinois Central Railroad, the New York Central System, and the Waugh Equipment Company for loaning the impact registers required for the test.

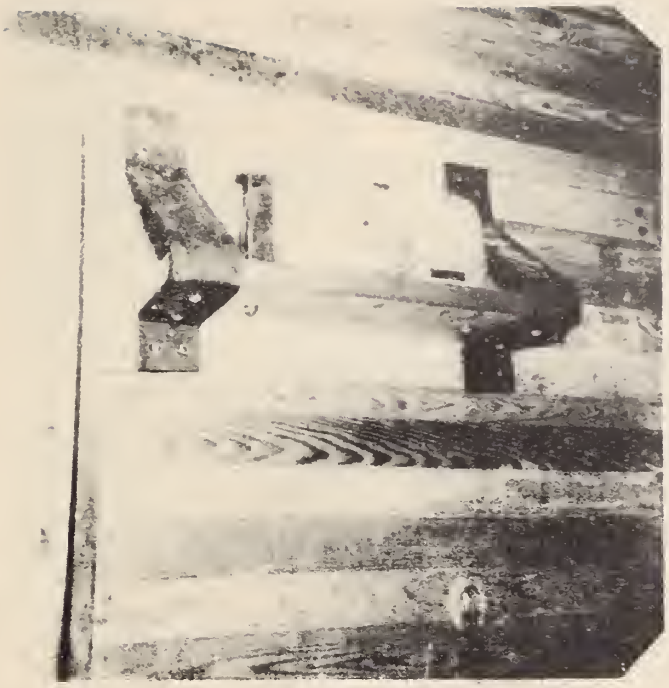

Fig. 1. Impact register mounted on wall bracket.

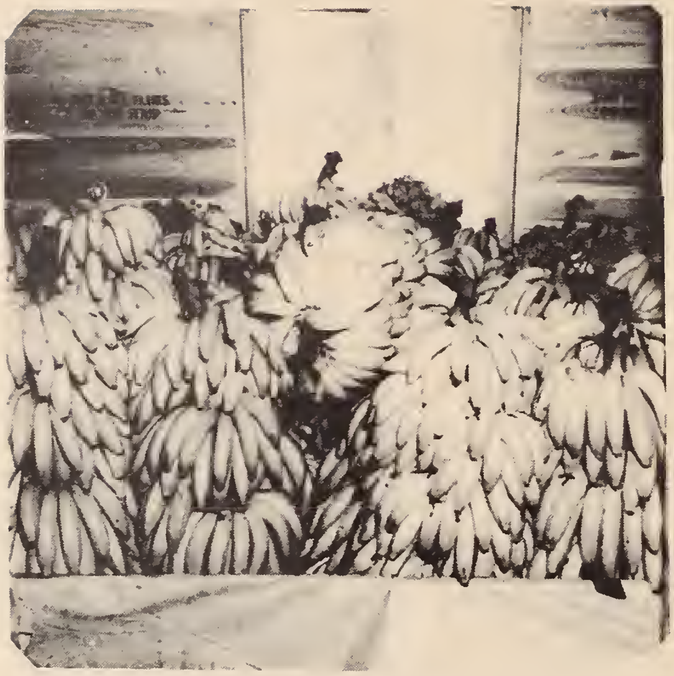

Fig. 2. Load at doorway when completed.
Showing crosswise "key" bunches.
(LDT 9478)

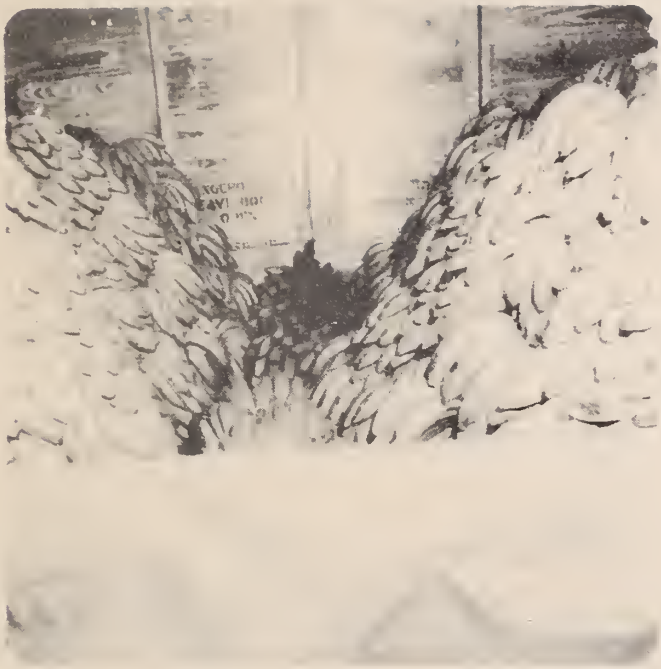

Fig. 3. Load at doorway at destination, "Key" bunches on floor racks, load sloping to each end of car. (LDT 9579)

Table 1. Size of Load and Inspection in Transit.

Car MDT	No. of Stems	Weight Lbs.	Average wt. per stem lbs.	Rows in top layer each end	Load Inspection[2]		
					Jackson, Miss. [1] 3:25 PM, 7/28	Fulton, Ky., 10:30 AM, 7/29	Markham Yds. (Chicago) 12:30 PM after placed over hump
9501	322	24,205	75.1	4/6	Perfect alignment	Load settled about 6 to 8 inches	Shifted at doorway
IC 51,000	353	24,930	70.6	5/5	One bunch out of line B end (stowage)	Do.	Do.
9485	280	24,445	87.3	4/4	Key bunches in adjoining rows, doorway slightly jumbled	Do.	Do.
9471	277	23,570	85.1	3/5	Do.	Do.	Do.
9496	273	24,195	88.6	3/4	Do.	Do.	Do.
9475	299	26,250	87.7	5/5	Do.	Do.	Do.
9503[3]	300	25,470	84.9	4/5	Do.	Do.	Do.
9497	313	25,070	80.0	4/6	Do.	Do.	No shifting
9517	307	25,310	82.1	5/6	Last row A end loose, doorway slightly jumbled (loose stowage)	12 inches	Shifted at doorway
9473	271	24,975	92.1	3/4	Perfect alignment	6 to 8 inches	Do.
9470	306	25,990	84.9	5/6	Do.	Do.	No shifting
9474[4]	283	24,385	86.1	4/4	Do.	Do.	Shifted at doorway
9472	300	26,370	87.9	5/5	Do.	Do.	Do.
9576[3]	310	23,790	76.7	4/5	Load shifted 3 ft. Key bunches now even with door post	Do.	Do.
9476	337	25,465	75.5	5/6	One bunch out of line B end (loose stowage)	Do.	Do.
9478	338	23,870	70.6	5/6	Perfect alignment	Do.	Do.
9477	333	24,785	74.4	5/6	Do.	Do.	Do.
9479	324	25,010	77.2	5/6	One bunch out of line B end (loose stowage)	Do.	Do.
9579	286	25,050	87.6	3/5	Perfect alignment	Do.	No shifting

[1] All loads had settled about two inches which was considered normal.
[2] At Memphis 12:25 AM 7/29, no change from Jackson, Miss., and at Bluford, Ill., 6:20 PM 7/29 no change from Fulton, Ky.
[3] Extra Buffer cars.
[4] Left train at Fulton, Ky., because of repairs needed.

Table 2. Station to Station Running Time Record - Banana Test
July-August, 1948

Station		Date	Time	Running Time Hrs.	Running Time Min.	Standing Time Hrs.	Standing Time Min.	Elapsed Time Hrs.	Elapsed Time Min.	Miles	Av. Speed M.p.h.	Cars[1/] in Train	Remarks
New Orleans, La.:													
Stuy. Dock Yd.	Lv.	7/28	7:25 A	-		-		-		0	-	96	
Mays Yard	Lv.	"	8:30 A	1	05	-		1	05	10	-	96	Change to road crew
McComb, Miss.:	Ar.	"	12:35 P	4	05	-		4	05	96	23.5	96	Change crew
	Lv.	"	12:50 P	-		0	15	4	20				
Jackson, Miss.:	Ar.	"	3:25 P	2	35	-		-		82	31.7	96	Inspection
	Lv.	"	4:30 P	-		1	05	3	40				
Gwin, Miss.:	Ar.	"	6:55 P	2	25	-		-		70	28.9	96	Change crew
	Lv.	"	7:00 P	-		0	05	2	30				
Memphis, Tenn.:	Ar.	7/29	12:25 A	5	25	-		-		144	24.7	96	Inspection and test
	Lv.	"	4:20 A	-		3	55	9	20			94	
Rialto, Tenn.:	Ar.	"	6:37 A	2	17	-		-					Water and meet order
	Lv.	"	6:54 A	-		0	17	2	34				
Dyersburg, Tenn.:	Ar.	"	7:53 A	0	59	-		-					Hot box and broken knuckle
	Lv.	"	8:48 A	-		0	55	1	54				
Fulton, Ky.:	Ar.	"	10:10 A	1	22	-		-		128	27.6	94	Inspection and test
	Lv.	"	1:45 P	-		3	35	1	57			81	
"North siding"	Ar.	"	1:55 P	0	10								Meet order
	Lv.	"	2:25 P	-		0	30	0	40				
Bluford, Ill.:	Ar.	"	6:20 P	3	55	-		-		126	27.5	81	Inspection
	Lv.	"	11:20 P	-		5	00	8	55			79	
Champaign, Ill.:	Ar.	7/30	3:25 A	4	05	-		-		130	31.6	79	Change crew
	Lv.	"	4:45 A	-		1	20	5	25			78	
Chicago, Ill.:													
Markham Yd.	Ar.	"	8:00 A	3	15	-		-		104	32.0	78	Inspection and test
	Lv.	"	1:20 P	-		5	20	8	35				
S. Water St.	Ar.	"	2:35 P	1	15	-		-		23			
Placed in I. C. fruit house S. Water St.		"	3:20 P	0	45								Cars unloaded in fruit house 7/31 except 9501, 9517, 9579 unloaded at Weber, 8/2/48.

Total running time Mays Yard to Markham 30 hrs., 33 min.
" miles " " " " 880
Average m.p.h. (Running) " " " 25.5

1/ Cars in train include all cars from engine to caboose.

Table 3. Longitudinal[1] impacts in draft gear test with bananas from New Orleans, La., to Chicago, Ill.

July 27 - 30, 1948

Car No.		MDT (95)[2] 9501[4]		1C (AL) 61,000[4]		MDT(MX)[3] 9486[4]	MDT(MX) 9471[4]		MDT(MX) 9496[4]	MDT(DX) 9475[4]		MDT(MX) 9497	MDT(95) 9517	MDT(W) 9473		MDT(W) 9470	MDT(WX) 9474	MDT(WX) 9472	MDT(DX) 9476	MDT(D) 9478	MDT(DX) 9477	MDT(D) 9479	MDT(95) 9579	
Register No.		3209	410	306	956	311	307	961	1049	308	3172	309	2014	312	2167	2076	313	3194	314	2477	316	2086	2068	
Date	Time			[5]																				
7/27	3-6P	1-2.1	2-2.2	0	0	0	0	0	1-2.6	0	0	0	1-2.1	0	0	0	0	0	0	0	0	0	0	3-9:00 PM, New Orleans, Loading,
		1-2.2	1-2.3	0	0	0	0	0	1-2.6	0	0	0	1-2.2	0	0	0	0	0	0	0	0	0	0	switching to Sty-Docks weighing,
		1-2.3	0	0	0	0	0	0	0	0	0	0	1-2.5	0	0	0	0	0	0	0	0	0	0	icing. Train of 96 cars.
	6-9P	0	0	0	0	1-2.2	1-3.1	1-2.7	2-2.1	0	0	2-2.1	1-2.1	1-2.7	1-2.6	0	0	0	0	0	0	0	3-2.1	
		0	0	0	0	1-2.3	0	0	2-2.5	0	0	4-2.2	1-2.3	0	0	0	0	0	0	0	0	0	4-2.2	
		0	0	0	0	0	0	0	1-2.2	0	0	1-2.6	1-2.4	0	0	0	0	0	0	0	0	0	2-2.3	
	9-12P	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	9:00 PM. New Orleans switching at
7/28	12-3A	0	0	0	0	0	0	0	0	0	0	0	1-2.1	0	0	0	0	0	0	0	0	0	0	Sty-Docks until 7:00 AM.
	3-6A	1-2.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	6-9A	0	0	0	0	0	0	0	0	0	0	0	1-2.7	0	0	0	0	0	0	0	0	0	1-2.1	7:25 AM. Left Sty-Docks
	9-12A	0	0	0	0	0	0	0	0	0	0	2-2.1	1-2.2	1-2.2	0	0	0	0	0	0	0	0	1-2.2	
		0	0	0	0	0	0	0	0	0	0	1-2.2	1-2.6	0	0	0	0	0	0	0	0	0	0	
		0	0	0	0	0	0	0	0	0	0	0	1-3.0	0	0	0	0	0	0	0	0	0	0	
	12-3P	1-2.1	1-2.2	0	0	0	0	0	0	0	0	1-2.1	1-2.1	0	0	0	0	0	0	0	0	0	0	12:35 PM arrived McComb, Miss.
		0	0	0	0	0	0	0	0	0	0	0	1-2.2	0	0	0	0	0	0	0	0	0	0	12:50 PM Left McComb, Miss.
	3-6P	0	0	0	0	0	0	0	0	0	0	1-2.2	1-2.2	0	0	0	0	0	0	0	0	0	1-2.2	3:26 PM arrived Jackson, Miss.
		0	0	0	0	0	0	0	0	0	0	0	1-2.7	0	0	0	0	0	0	0	0	0	1-2.1	4:30 PM left Jackson, Miss.
	6-9P	0	0	0	0	0	0	0	1-2.1	0	0	1-2.2	1-3.0	1-2.4	0	0	0	0	0	0	0	0	0	6:55 PM arrived Gwin, Miss.
		0	0	0	0	0	0	0	0	0	0	1-2.5	1-3.2	0	0	0	0	0	0	0	0	0	0	7:00 PM left Gwin, Miss.
	9-12P	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
7/29	12-3A	1-2.2	1-2.2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	12:25 AM arrived Memphis, Tenn. iced
		1-2.1	1-2.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	made quick stop.
	3-6A	0	0	0	0	0	0	0	0	0	0	0	1-2.6	0	0	0	0	0	0	0	0	0	0	4:20 AM left Memphis, Tenn., with
	6-9A	0	0	0	0	0	1-2.1	0	1-2.1	0	0	2-2.1	1-2.3	0	0	0	0	1-2.1	0	0	0	0	2-2.3	81 car train.
		0	0	0	0	0	0	0	0	0	0	1-2.2	1-2.6	0	0	0	0	1-2.2	0	0	0	0	1-2.2	
	9-12A	1-2.2	1-2.2	0	0	0	0	0	0	0	0	1-2.6	1-2.4	1-2.4	1-2.1	1-2.2	1-2.1	0	0	0	0	0	0	10:10 AM arrived Fulton, Ky. quick
		0	0	0	0	0	0	0	0	0	0	0	1-3.2	0	0	0	0	0	0	0	0	0	0	stop.
	12-3P	0	0	0	0	0	0	0	1-2.4	0	0	1-2.1	0	0	0	0	0 [5]	0	0	0	0	0	0	1:45 PM left Fulton, Ky.
	3-6P	0	0	0	0	0	0	0	1-2.2	0	0	2-2.1	2-2.3	0	0	0	0	0	0	0	0	0	0	
		0	0	0	0	0	0	0	0	0	0	2-2.2	1-2.4	0	0	0	0	0	0	0	0	0	0	
		0	0	0	0	0	0	0	0	0	0	1-2.3	1-2.5	0	0	0	0	0	0	0	0	0	0	
	6-9P	0	0	0	0	0	0	0	0	0	0	0	1-2.4	0	0	0	0	0	0	0	0	0	0	6:20 PM arrived Bluford, Ill. Iced
		0	0	0	0	0	0	0	0	0	0	0	2-2.1	0	0	0	0	0	0	0	0	0	0	
	9-12P	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1-2.7	0	0	0	0	0	0	11:20 PM left Bluford, Ill.
7/30	12-3A	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1-2.6	0	0	0	0	0	0	3:25 AM arrived Champaign, Ill.
	3-6A	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3:45 AM left Champaign, Ill.
	6-9A	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1-3.3	0	0	0	0	0	0	6:00 AM arrived Markham Yards (Chicago
	9-12A	1-2.4	1-2.4	2-3.1	1-3.0	1-3.7	1-3.7	1-3.4	1-3.8	1-3.2	1-3.0	1-3.8	1-2.2	1-4.8	1-4.3	1-4.3	1-2.2	2-2.1	1-2.6	1-2.7	1-3.3	1-2.7	2-2.3	11:50AM to 12:20PM cars humped. Ill.)
		1-2.3	1-2.2	0	1-3.4	1-3.8	1-4.33	1-3.6	1-2.5	1-2.3	1-2.4	1-2.3	1-2.4	1-3.9	1-3.7	1-2.6	0	1-3.3	0	0	0	0	0	
		0	0	0	0	0	0	0	0	0	0	0	0	1-3.1	1-2.9	0	0	0	0	0	0	0	0	
	12-3P	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	3-6P	1-2.9	1-2.8	0	0	0	0	0	0	1-2.7	1-2.6	1-2.1	1-2.3	0	0	1-3.3	0	1-2.3	0	0	0	0	1-2.2	4:00 PM spotted for unloading South
		1-2.2	1-2.3	0	0	0	0	0	0	0	0	0	1-2.4	0	0	0	0	0	0	0	0	0	1-2.3	Water St. fruit shed.
		0	0	0	0	0	0	0	0	0	0	0	2-2.1	0	0	0	0	0	0	0	0	0	0	

[1] Savage impact registers used in all cars. Impacts in zone 1 of tape not tabulated, zones divided into tenths, i.e., reading of 2.1 means 0.1 in second zone.

[2] Car symbols: (95) Miner gear, block car (i.e., car separating one group of test cars from another); (AL) aluminum car, Duryea undersill, grooved metal floor racks; (M) Miner draft gear; (X) special grooved floor racks; (W) Waughmat draft gears.

[3] First register listed in each car was mounted on shelf, the second one was nailed on opposite wall, clocks all to the rear end of train.

[4] These cars had two impacts at Markham yards due to second humping.

[5] This car bad-ordered at Fulton, Ky., not with test train balance of trip.

Table 4. Vertical Impacts In Draft Gear Test With Bananas, New Orleans, La., to Chicago, Ill.

July 27 -30, 1948

Car Number:		(95) 9501 "G's"			(AL) 51,000 "G's"			(MX) 9485 "G's"			(WX) 9471 "G's"			(DX) 9475 "G's"			(MX) 9487 "G's"			(WX) 9473 "G's"			(WX) 9474 "G's"			(DX) 9476 "G's"			(DX) 9477 "G's"		
Register No.:		310 2/			306			311 2/			307			308			309			312			313			314			316		
Date	Time	0.9 1.4	1.5 3.0	Over 3.0	0.9 1.4	1.5 3.0	Over 3.0	0.9 1.4	1.5 3.0	Over 3.0	0.9 1.4	1.5 3.0	Over 3.0	0.9 1.4	1.5 3.0	Over 3.0	0.9 1.4	1.5 3.0	Over 3.0	0.9 1.4	1.5 3.0	Over 3.0	0.9 1.4	1.5 3.0	Over 3.0	0.9 1.4	1.5 3.0	Over 3.0	0.9 1.4	1.5 3.0	Over 3.0
7/27	3-6P	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	6-9P	1	0	0	0	0	0	6	2	0	2	0	0	1	0	0	11	1	0	0	0	0	0	0	0	0	0	0	0	0	0
	9-12P	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7/28	12-3A	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	3-6A	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	6-9A	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	9-12A	8	0	0	0	0	0	7	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0	0	0	15	0	0	4	0	0
	12-3P	18	0	0	0	0	0	6	1	0	0	0	0	0	0	0	3	0	0	0	0	0	0	0	0	18	0	0	7	0	0
	3-6P	8	0	0	0	0	0	3	1	0	0	0	0	0	0	0	7	0	0	0	0	0	0	0	0	3	0	0	1	0	0
	6-9P	23	0	0	0	0	0	1	1	0	0	0	0	0	0	0	6	0	0	0	0	0	0	0	0	16	0	0	3	0	0
	9-12P	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	21	0	0	5	0	0
7/29	12-3A	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	3-6A	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	6-9A	6	0	0	0	0	0	3	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	15	0	0	0	0	0
	9-12A	7	0	0	0	0	0	1	0	0	0	0	0	0	0	0	3	0	0	0	0	0	0	0	0	18	0	0	2	0	0
	12-3P	2	0	0	0	0	0	4	0	0	0	0	0	4	0	0	1	0	0	0	0	0	1 3/	0	0	0	0	0	0	0	0
	3-6P	23	0	0	0	0	0	6	0	0	0	0	0	0	0	0	17	0	0	0	0	0	0	0	0	29	0	0	2	0	0
	6-9P	8	0	0	0	0	0	3	0	0	0	0	0	0	0	0	3	0	0	0	0	0	0	0	0	5	0	0	0	0	0
	9-12P	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	13	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7/30	12-3A	24	0	0	0	0	0	3	0	0	0	0	0	1	0	0	24	0	0	0	0	0	0	0	0	38	0	0	0	0	0
	3-6A	8	0	0	0	0	0	1	0	0	0	0	0	0	0	0	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	6-9A	11	0	0	0	0	0	1	0	0	0	0	0	0	0	0	6	0	0	0	0	0	1	0	0	44	0	0	0	0	0
	4/ 9-12A	0	1	0	0	0	2	0	1	1	0	1	1	0	0	2	0	1	1	0	1	1	1	0	0	0	0	1	0	1	0
	4/ 12-3P	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	3-6P	0	1	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
Total:		155	3	1	0	0	2	45	6	1	2	1	1	9	1	2	104	3	1	0	1	1	3	0	0	222	0	1	24	1	0
Grand Total			159			2			52			4			12			108			2			3			223			25	

1/ Car Symbols: (95) Miner gear, block car, (i.e. car separating one group of test cars from another); AL-aluminum car, Duryea undersill, grooved metal floor racks; M-Miner draft gear; (X) special grooved floor racks; (W)-Waughmat draft gears.

2/ All 2-way recorders calibrated by Impact Register Company prior to test; G-force equivalent to gravity. Registers used in cars 9501 and 9485 failed to meet their calibration standards.

3/ This car bad-ordered at Fulton, Ky., traveled on different train to destination, was not put over hump tracks with other cars.

4/ Speeds at impacts of cars as they were humped singly in Markham Yards:

9501 - 6 MPH	9485 - 7 MPH	9496 - 6 MPH	9503 - 8 MPH	9517 - 5 MPH	9472 - 6 MPH	9476 - 5 MPH	9477 - 6 MPH	9579 - 5 MPH
51000 - 8 "	9471 - 6 "	9475 - 6 "	9497 - 5 "	9470 - 5 "	9576 - 6 "	9478 - 6 "	9479 - 8 "	

Note: Cars 9503 and 9475 stuck in retarder, they were freed by 9496 which stuck in retarder, followed by 9471, 9485, 51000, and 9501. These 5 cars came free and hit the train together. All 7 cars were pulled back and humped singly. Thus these cars had 2 impacts.

Table 5. Inspection of Bananas when Unloaded.

	Vertical Stems Bottom Hand Damage Only						1/ 3/4 Stems on Top General Scarring						Vertical Stems Side Wall and Bulkhead Damage					
Car No. & Symbol	Stems Checked	H	M	S	C	Total	Stems Checked	H	M	S	C	Total	Stems Checked	H	M	S	C	Total
9501 (95)	247	2.5	8.9	6.2	0	17.6	79	1.3	5.0	17.4	0	23.7	53	5.7	31.1	8.0	0	44.8
51,000 AL.	258	3.9	5.0	4.8	0	13.7	95	0	3.2	7.6	0	10.9	53	1.9	11.3	14.6	0	27.8
9485 Mx	221	0.1	4.5	5.4	0	10.0	56	0	5.3	12.1	0	17.4	64	3.1	21.8	11.7	0	36.6
9471 Wx	221	0.9	2.7	9.9	0	13.5	51	0	1.9	7.8	0	9.7	46	8.6	35.8	4.8	0	49.2
9496 Mx	217	1.0	4.6	6.6	0	12.2	50	2.2	2.0	11.5	0	15.7	51	0	19.6	14.7	0	34.3
9475 Dx	228	2.6	3.1	5.5	0	11.2	72	0	3.5	12.5	0	16.0	51	3.9	17.6	14.2	0	35.7
9497 Mx	239	0	3.8	8.2	0	12.0	69	0	4.9	10.5	0	15.4	49	2.0	20.4	26.5	0	48.9
9517 (95)	239	1.8	5.2	5.9	0	12.9	68	1.4	8.1	17.2	0	16.7	51	3.9	27.4	10.3	0	41.6
9473 W	225	0	1.1	6.4	0	7.5	49	0	1.0	10.2	0	11.2	58	3.4	18.8	14.6	0	36.8
9470 W	237	1.2	4.6	5.5	0	11.3	68	0	4.4	8.4	0	12.8	53	7.5	24.5	10.8	0	42.8
9474 Wx	225	0.9	2.2	8.8	0	11.9	56	0	3.5	9.5	0	12.0	49	4.1	27.5	10.2	0	41.8
9472 Wx	229	0.4	4.1	6.4	0	11.9	68	0	2.9	11.0	0	13.9	51	3.9	23.5	12.2	0	39.6
9476 Dx	250	0.8	3.4	6.2	0	10.4	88	0	1.1	3.9	0	5.0	49	0	20.4	15.0	0	35.4
9478 D	262	0.4	0.2	4.5	0	5.1	79	0	0	3.5	0	3.5	50	0	16.0	17.0	0	23.0
9477 Dx	250	0.4	0.6	5.8	0	6.8	82	0	0.6	5.5	0	6.1	48	0	14.6	17.2	0	31.8
9479 D	247	0	1.6	5.1	0	6.7	81	0	4.9	4.9	0	9.8	54	1.8	20.3	11.1	0	33.2
9579 (95)	225	2.4	6.4	7.5	0	16.3	59	0	6.7	15.0	0	21.7	47	2.1	29.8	9.0	0	40.9

H - Heavy M - Medium S - Slight C - Clean 1/ Including 2 Key Bunches

Symbols - 95 and M - Miner Gear, X - Special Floor Racks, W - Waughmat, D - Duryea, AL - Duryea and special metal floor racks